
Neuwiedia malipoensis, a New Species (Orchidaceae, Apostasioideae) from Yunnan, China

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ABSTRACT. *Neuwiedia malipoensis* Z. J. Liu, L. J. Chen & Ke Wei Liu (Orchidaceae, Apostasioideae), from southeastern Yunnan Province in China, is described, illustrated, and photographed. The new species is characterized by a true corolla lip, which is widely obovate and concave, with a subterete claw at the base and a fleshy linear callus extending from its claw to the upper portion. By these features it can be easily distinguished from its allied *N. veratrifolia* Blume, *N. balansae* Baill. ex Gagnep., and other species of this genus.

Key words: Apostasioideae, China, IUCN Red List, *Neuwiedia*, Orchidaceae, Yunnan.

Neuwiedia Blume is a genus within the subfamily Apostasioideae (Orchidaceae) for which 17 names have been described. Approximately 10 species are distributed across southeastern Asia from southern China through Southeast Asia to New Guinea and the Pacific Islands. Only the one species, *N. singapureana* (Wall. ex Baker) Rolfe, has been reported for the Chinese flora (Chen, 1999). The flowers of this genus are nearly actinomorphic, with three fertile stamens and a simple lip similar to, but a little larger than, the remaining two petals; the lip's midrib is usually raised on the upper surface.

The new taxon was collected from southeastern Yunnan Province in China during fieldwork in 2008. It is similar in habit and floral morphology to other *Neuwiedia*, except that the corolla lip consists of a concave, widely obovate blade with a subterete claw at the base, and a fleshy linear callus that is both 1 mm wide and high and extends from its claw to the upper part of the corolla blade. This lip is quite distinct from the other two petals and the flowers are obviously zygomorphic in appearance, in contrast to other species in the genus. This undescribed species

represents an advanced type in the genus. The lip structure easily distinguishes the new species from the allied *N. veratrifolia* Blume and *N. balansae* Baill. ex Gagnep., as well as other species of the genus.

The living plants and ecological environment were observed in the field in Malipo County (ca. 23°N) in southeast Yunnan, China, in August 2008. Fresh flowers were examined under a stereoscope (Guiguang XTL-500, Guilin, China). Comparison of the vegetative and floral structures was made between this taxon and *Neuwiedia veratrifolia* and allies based on fresh material, herbarium specimens, and the available literature.

Neuwiedia malipoensis Z. J. Liu, L. J. Chen & Ke Wei Liu, sp. nov. TYPE: China. Yunnan: Malipo, Ma An Shan, 1100 m, evergreen broad-leaved forest, limestone mountainous area, 1100 m, 11 Aug. 2008, Z. J. Liu 4058 (holotype, NOCC). Figures 1, 2.

Species nova *Neuwiediae veratrifoliae* Blume et *N. balansae* Baill. ex Gagnep. similis, sed a priore floribus praeter callum flavum labelli albis atque labello late obovato concavo basi subtereti-unguiculato, a posteriore foliis multo longioribus 30–63 cm (10–20 cm in *N. balansae*) longis, petiolo 12–20 cm (3–10 cm in *N. balansae*) longo atque labelli callo lineari carnosio ab basi unguis ad 2/3 longitudinis laminae (ad apicem in *N. balansae*) extenso differt.

Terrestrial plants 65–70 cm tall; rhizome 13–15 cm, 1.5–1.7 cm diam., with evident nodes, bearing stout roots. Leaves many, nearly tufted on the short stem; leaf blades oblong to lanceolate, 30–63 × 3.3–4.8 cm, apex long-acuminate; petiole 12–20 cm, margin membranous, base slightly dilated and

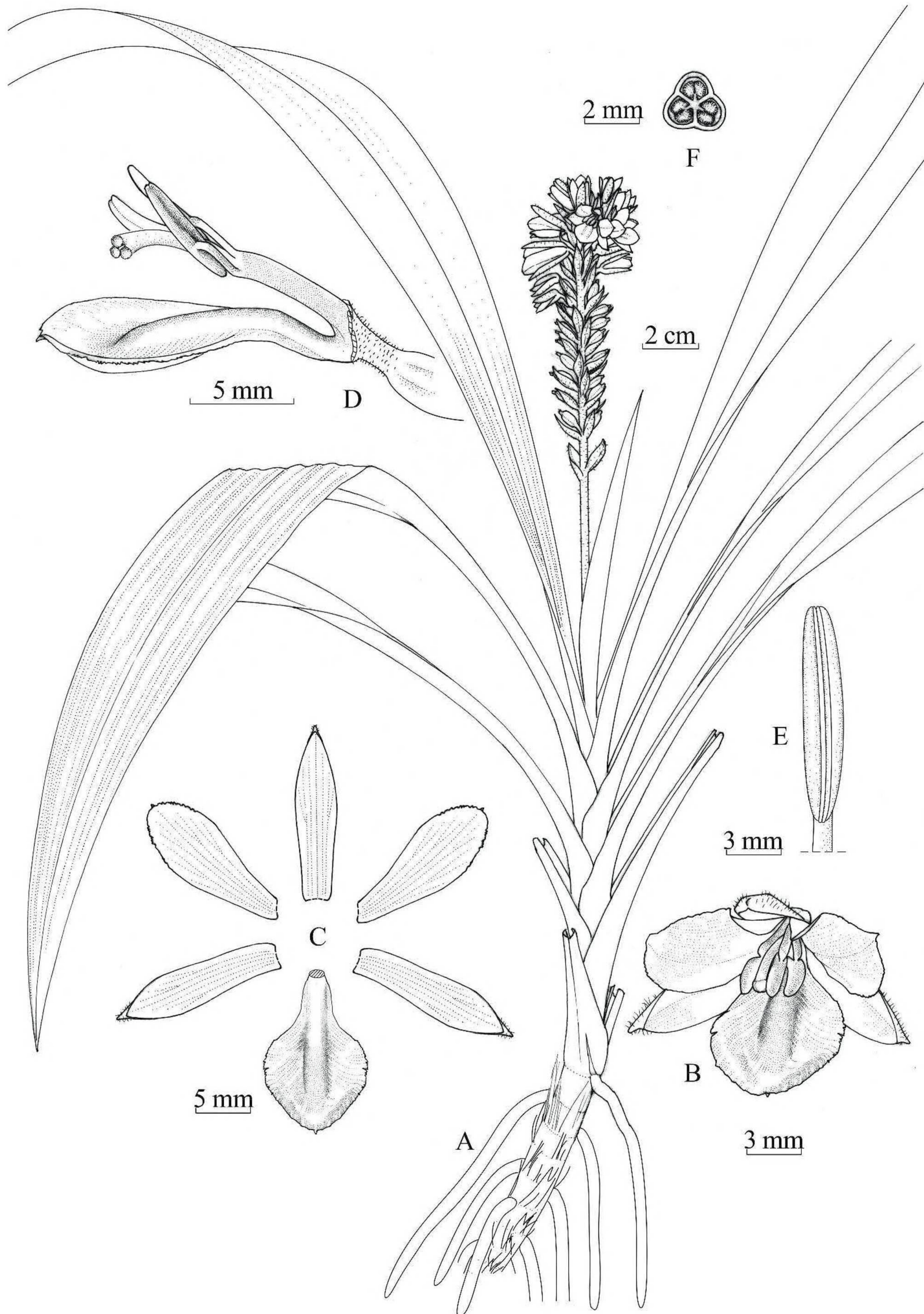


Figure 1. *Neuwiedia malipoensis* Z. J. Liu, L. J. Chen & Ke Wei Liu. —A. Fertile plant habit, with both flowers and fruits. —B. Intact flower (front view). —C. Dissected flower, showing the dorsal sepal, two petals, two lateral sepals, and the lip. —D. Lip and column (lateral view), with the sepals and petals removed. —E. Anther. —F. Capsule cross section. A–F drawn by X. Y. Ma from the holotype *Liu 4058* (NOCC).

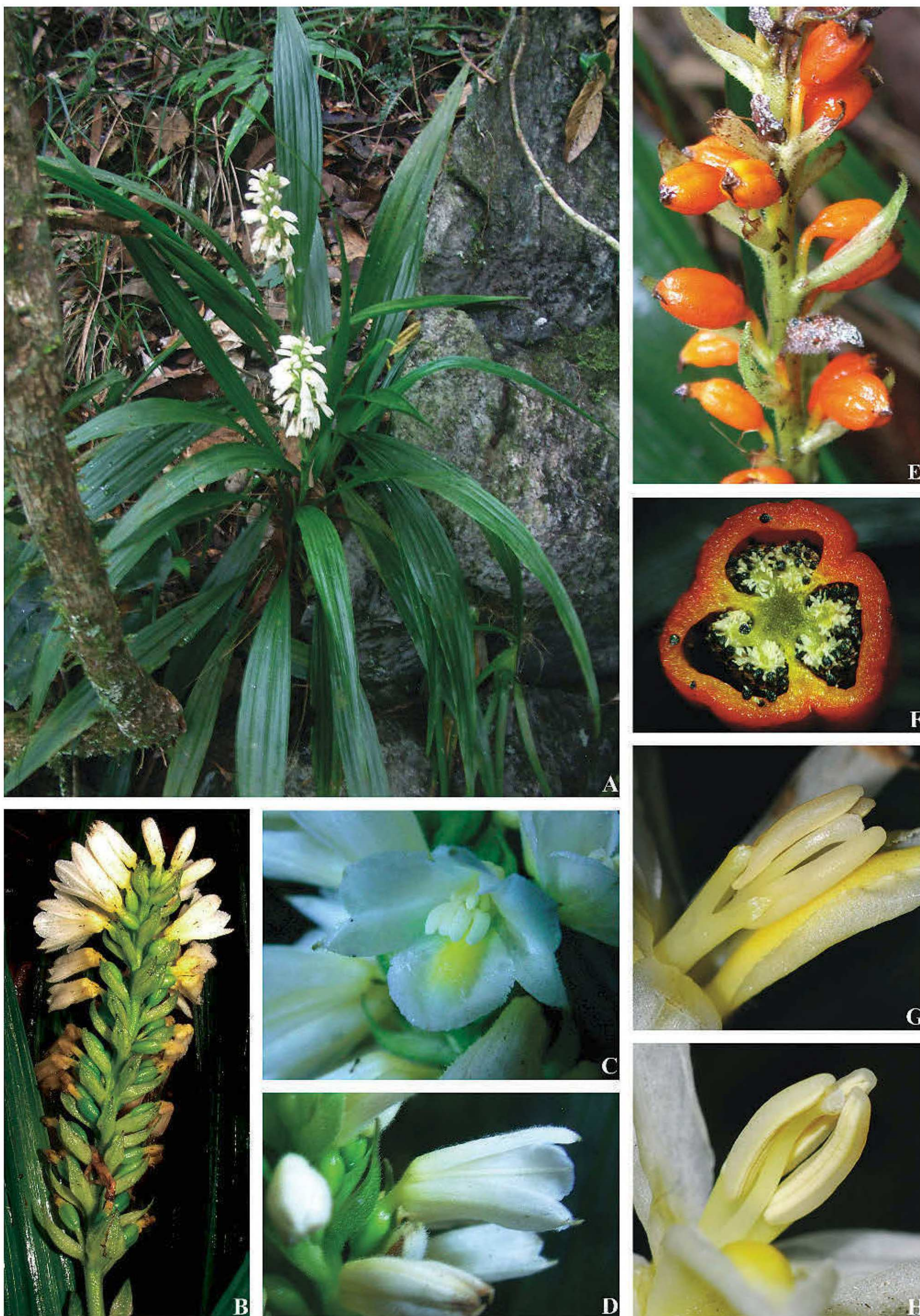


Figure 2. *Neuwiedia malipoensis* Z. J. Liu, L. J. Chen & Ke Wei Liu. —A. Fertile plants at the type locality in Malipo, Yunnan. —B. Close-up of inflorescence. —C. Flower (front view). —D. Flowers (side view). —E. Infructescence. —F. Capsule cross section. —G. Close-up of column in flower (side view). —H. Close-up of anthers and style (side view). A–H taken by L. J. Chen from the type locality from the original population collected.

clasping. Scape to 35 cm; raceme ca. 11 cm, 20-flowered or more; rachis, with glandular trichomes; floral bracts ovate to lanceolate, 1–1.7 cm, abaxially with glandular trichomes. Flowers not resupinate, white, except for the yellow linear callus on the lip, not opening widely; sepals narrowly elliptic, 1.6–1.9 × 0.35–0.4 cm, hooded apically, shortly aristate toward abaxial apex, abaxially with glandular trichomes, dorsal sepal usually slightly smaller than lateral pair; petals broadly cuneate, obovate, 1.6–1.8 × 0.5–0.6 cm, apex mucronate, abaxially sparsely glandular pubescent; labellum bipartite; blade ± widely obovate, concave, margins erose, base narrowing into a subterete claw, with a fleshy linear callus extending from the base of the claw distally for 2/3 of the blade length; column erect, 10–11 mm; stamens subequal to stigma; filaments 3.3–3.7 × 0.6–0.7 mm; anthers linear, 5.8–6.2 mm; ovary elliptic, 7–8 mm; style 6–6.5 mm, subterete; stigma 3-lobed. Immature capsule ellipsoid.

Phenology. *Neuwiedia malipoensis* was observed in flower from July to August at the type locality.

Habitat and ecology. *Neuwiedia malipoensis* was observed to grow in wet places in a pristine evergreen broad-leaved forest on a limestone slope at the southern fringe of a subtropical zone at an elevation of ca. 1100 m. The dominant plant associates include trees and shrubs such as *Zanthoxylum armatum* DC. (Rutaceae), *Luculia pinceana* Hook. (Rubiaceae), *Brassaiopsis glomerulata* (Blume) Regel (Araliaceae), *Machilus rufipes* H. W. Li (Lauraceae), *Ficus hirta* Vahl var. *imberbis* Gagnep. (Moraceae), *Trevesia palmata* (Roxb. ex Lindl.) Vis. (Araliaceae), *Cornus oblonga* Wall. (Cornaceae), and *Rubus paniculatus* Sm. (Rosaceae). Herbaceous associates include *Liparis delicatula* Hook. f. and *L. assamica* King & Pantl. (Orchidaceae), *Debregeasia orientalis* C. J. Chen, *Elatostema pachyceras* W. T. Wang, *Pilea glaberrima* (Blume) Blume, and *P. howelliana* Hand.-Mazz. (Urticaceae), *Impatiens arguta* Hook. f. & Thomson (Balsaminaceae), *Cynoglossum zeylanicum* (Vahl ex Hornem.) Thunb. ex Lehm. (Boraginaceae), *Artemisia indica* Willd. (Asteraceae), *Galium asperuloides* Edgew. subsp. *hoffmeisteri* (Klotzsch) H. Hara (Rubiaceae), *Microsorium superficiale* (Blume) Ching (Polypodiaceae), and *Glaphyroidopsis erubescens* (Wall. ex Hook.) Ching (Thelypteridaceae).

The type locality is in a subtropical highland in the monsoon region, with an average annual temperature of 17.6°C, ranging from 10.1°C to 23°C. The canopy density was estimated at 80%–85% coverage. The dry season extends from December to March, when

there is no fog, and the rainy season is from April to November, when this area is often covered by dense fog in the night and morning (Liu et al., 2008a, 2008b). The soil types are mainly developed from limestone, and the soil layer is rather thin. The vegetation in this area consists of broad-leaved forests, coniferous forests, thickets, and grasslands (Liu et al., 2008a, 2008b).

IUCN Red List category. This species is very rare. There were altogether 97 individuals found exclusively in six populations. We failed to see more plants in the vicinity of the type locality at Malipo, and this location is often threatened by human activity. The conservation status of this new species is assessed as Endangered (EN), according to IUCN (2001) criteria.

Discussion. In comparison to derived taxa in the other four subfamilies of the Orchidaceae, *Neuwiedia* of the Apostasioideae is a rather primitive genus, from whose allies or ancestors the Orchidaceae may have derived in a past paleogeologic period (Kocyan et al., 2004). The Apostasioideae remains a poorly known subfamily, with only the two genera *Neuwiedia* and *Apostasia* Blume. *Neuwiedia* is distinguished from *Apostasia* by its three fertile stamens with fairly long filaments, versus two stamens, with or without a central staminode, with short filaments adnate to the style in *Apostasia*. The stigma is trilobed in *N. malipoensis*, but noted as capitate in *Apostasia* (Chen, 1999; Chen et al., 2009).

The typical perianth of *Neuwiedia* is somewhat zygomorphic in appearance, with the lip slightly larger than the lateral two petals; the midvein of the lip is usually raised on the upper surface. The perianth of the new species shows a strong zygomorphic tendency and the central petal, or lip, is more or less differentiated into a short subterete claw and a widely obovate, concave blade. On its upper surface there is a fleshy linear callus extending from the base of the claw distally for two-thirds of the blade length. This makes the flowers more clearly zygomorphic in appearance, and there is no doubt they are most derived within the genus.

This new species is quite different from *Neuwiedia singaporeana*, the only species of this genus found in China, which has a lip similar in shape and size to the two lateral petals except for the midvein raised on the upper surface. Our new plant is somewhat similar to *N. veratrifolia* and *N. balansae*. *Neuwiedia veratrifolia* has yellow flowers, and the lip lacks a terete claw at the base, while *N. balansae* has smaller leaves, only 10–20 cm long, with shorter petioles 3–10 cm long, and the fleshy linear callus on the lip

extends from a sessile base to its apex. *Neuwiedia balansae* has been reduced by some authors to a synonym of *N. singaporeana* (Seidenfaden, 1992; Chen, 1999; Chen et al., 2009), but was treated by Averyanov (2008) as a variety of *N. zollingeri* Rchb. f., as *N. zollingeri* var. *balansae* (Baill. ex Gagnep.) Aver.

The occurrence of *Neuwiedia malipoensis* in Malipo is of phytogeographic interest. Malipo County is located in southeast Yunnan Province in China, where many tropical and subtropical plants converge with temperate plants. In the Orchidaceae, the following exemplary taxa mix in this region: the temperate *Cypripedium malipoense* S. C. Chen & Z. J. Liu (Chen & Liu, 2004), the northern and subtropical *Ypsilorchis fissipetala* (Finet) Z. J. Liu, S. C. Chen & L. J. Chen (Liu et al., 2008b), the southern Vietnamese *Paphiopedilum delenatii* Guillaumin (Averyanov et al., 2003) and the southeastern Asian *Liparis gibbosa* Finet (Shui & Chen, 2006). Malipo and adjacent counties in southeast Yunnan are characterized by a karst topography, with numerous limestone peaks. The area is richly diverse in its flora, particularly so for orchids, with no less than 200 species of orchids recorded (Chen & Tsi, 1997; Li, 2003; Shui & Chen, 2006), many of which are recent discoveries and include *Phalaenopsis malipoense* Z. J. Liu & S. C. Chen, *Cypripedium singchii* Z. J. Liu & L. J. Chen, *Cypripedium malipoense* S. C. Chen & Z. J. Liu, and *Cheirostylis malipoensis* X. H. Jin & S. C. Chen.

Paratype. CHINA. **Yunnan:** Malipo Co., Ma An Shan, 1000 m, 20 July 2010, *Z. J. Liu* 5050 (PE).

Literature Cited

- Averyanov, L. 2008. The orchids of Vietnam. Illustrated survey. Part 1. Subfamilies Apostasioideae, Cypripedioideae and Spiranthoideae. *Turczaninowia* 11(1): 5–168.
- Averyanov, L., P. Cribb, P. K. L  c & T. H. Nguy  n. 2003. Slipper Orchids of Vietnam, with an Introduction to the Flora of Vietnam. Compass Press Limited and Royal Botanical Gardens Kew, London.
- Chen, S. C. 1999. Apostasioideae. Pp. 13–19 in K. Y. Lang (editor), *Flora Reipublicae Popularis Sinicae*, Vol. 17. Science Press, Beijing.
- Chen, S. C. & Z. H. Tsi. 1997. *The Orchids of China*. China Forestry Publishing House, Beijing.
- Chen, S. C. & Z. J. Liu. 2004. A new species and a new variety of *Cypripedium* (Orchidaceae) from China. *Acta Bot. Yunnan.* 26(4): 382–384.
- Chen, S. C., S. W. Gale & P. J. Cribb. 2009. *Apostasia* and *Neuwiedia*. Pp. 20–21 in Z. Y. Wu, P. H. Raven & D. Y. Hong (editors), *Flora of China*, Vol. 25. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. Gland, Switzerland, and Cambridge, United Kingdom.
- Kocyan, A., Y.-L. Qiu, P. K. Endress & E. Conti. 2004. A phylogenetic analysis of Apostasioideae (Orchidaceae) based on ITS, *trnL-F* and *matK* sequences. *Pl. Syst. Evol.* 247: 203–213.
- Li, H. 2003. Orchidaceae. Pp. 100–819 in Z. Wu (editor), *Flora Yunnanica*, tomus 14, Spermatophyta. Science Press, Beijing.
- Liu, Z. J., L. J. Chen, W. H. Rao, L. Q. Li & Y. T. Zhang. 2008a. Correlation between numeric dynamics and reproductive behaviour in *Cypripedium lentiginosum*. *Acta Ecol. Sin.* 28(1): 111–121.
- Liu, Z. J., S. C. Chen & L. J. Chen. 2008b. *Ypsilorchis* and *Ypsilorchidinae*, a new genus and a new subtribe of Orchidaceae. *J. Syst. Evol.* 46(4): 622–627.
- Seidenfaden, G. 1992. The orchids of Indochina. *Opera Bot.* 114: 1–502.
- Shui, Y. M. & W. H. Chen. 2006. *Seed Plants of the Karst Region in China*. Science Press, Beijing.